VI. *Strepsiptera, a new Order of Insects proposed; and the Characters of the Order, with those of its Genera, laid down.* *By the Rev. William Kirby, F.L.S.*

Read March 19, 1811.

When we consider the vast number of non-descript species, with which, since Linné gave the last finish to his System of Entomology, the European cabinets of insects have been inundated, it seems remarkable that few or none have hitherto been discovered which will not arrange under some one or other of his orders: for although Olivier, and after him Latreille and the best modern entomologists, following the illustrious Baron De Geer*, have very properly made a distinct order of such of the Linnean *Hemipterous* genera, as instead of a rostrum are furnished with the instruments of mastication, namely, the old genera *Blatta*, *Mantis* and *Gryllus*†; yet this change was not so much the consequence of an influx of new insects, as of a more correct appreciation of the characters of those that were already known*. Rossi therefore may be deemed peculiarly fortunate in being the first discoverer of a singular tribe of insects which indubitably belongs to a new order, since it will arrange, whether we consider its metamorphosis or characters, under none of those at present established.

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* De Geer was the first who separated the insects to which I allude from the rest of the *Hemiptera*, and he gave them the name of *Dermaptera*, a name not improper, and which in justice to him should have been retained. They are the *Orthoptera* of Olivier &c. and constitute the seventh class of the second order of De Geer's first general class. See *Mem. tom.* vii. *tableau general* facing *p.* 862. *Recapitulation de l'Arrangement, &c. ibid. p.* 759. and also *tom.* iii. *Mem.* 9. *p.* 399.

† The genus *Forficula* Linn. is also by the above authors arranged with the *Orthoptera*, and

and it must be allowed that both its metamorphosis and the peculiar structure of its maxillæ (Fabr.) entitle it to a place in that order. The substance of its elytra, however, and its wings folded transversely as well as longitudinally, give it some claim likewise to a station amongst the *Coleoptera*. I am not sure that it will not be adviseable, since, not to name the peculiar anal forceps, its wings in their structure, figure and veins, (a circumstance of no small importance in ascertaining orders as well as genera) are quite unique and *sui generis*, to consider these insects, which Mr. Leach also once suggested to me, as forming an intermediate order between *Coleoptera* and *Orthoptera*. If entomologists should judge this hint worthy of attention, I would further suggest that De Geer's name above mentioned (*Dermaptera*), which is not at all inapplicable, should be given to it.

* This principle of improvement with respect to orders might, I think, be carried still further, and applied to another of Linné's Genera, *Phryganea*, which is evidently not in its proper place, being more nearly allied to the *Lepidoptera* than to the *Neuroptera*, as both Reaumur and De Geer have long ago observed (*Reaum. tom.* iii. *Mem.* 5. *p.* 176 *&c.* and *De Geer tom.* ii. *partie* 1. *Mem.* 7. *p.* 497. and *tom.* vii. *p.* 715 *&c.*) Although some other insects (*Myrmeleon* and *Hemerobius*) placed in the *Neuroptera* do not agree with the rest in their metamorphosis, yet in their perfect state they exhibit the principal characters of the order, and therefore are properly retained in it; but *Phryganea* differs from the rest both in metamorphosis and characters. Its metamorphosis is very peculiar, the larva imitating many of the *Tineæ* in constructing of various materials a kind of case for its habitation, from which circumstance they are commonly called *Case-worms*; and the pupa, which is *incomplete*, and at first quiescent, just before its final change, by a wonderful provision of an allwise Creator, becomes locomotive that it may place itself in a situation of security out of the water before it casts off its exuviæ; and for this purpose the antennæ and the four anterior legs are not confined under the general envelope, though each has its peculiar integument, so that the animal can use them when the time comes for it to emerge from the water and commence a denizen of the air. For further particulars I must refer the reader to the Memoir of De Geer above quoted, where he will meet with much interesting matter. The imago exhibits few or none of the characters of the other *Neuropterous*

established. The insect appertaining to this tribe which he discovered, he has described under the name of *Xenos Vesparum**; but he seems himself to have entertained no suspicion of its not belonging to any of the present orders, since without hesitation or remark he assigns it a place next to *Ichneumon*†. When I first called the attention of entomologists to a British insect of

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Neuropterous genera. The wings are veined in a peculiar manner, without reticulations, in some degree like those of *Lepidoptera*. The antennæ resemble much those of the *Tinea* tribe, and the tibiæ of many of them are armed with the two pair of spurs observable in so many of the Moths; but they have no spiral tongue, the wings though hairy have no scales, the under wings are folded longitudinally, and the head, besides the usual compound eyes, has three stemmata. If these remarks appear to entomologists well founded, and it be thought right to consider *Phryganea* as constituting a new order, I think it might be distinguished, since the wings of all the known species are hairy, by the name of *Trichoptera*.

It will appear, I fear, an unreasonable addition to this already long note, but I cannot help further observing upon this subject, that the student in entomology labours under peculiar disadvantages to which the botanist is a stranger, from the small number of orders into which the class of insects is divided. These animals, I imagine, fall not far short of plants in number of species, and yet we have only eight orders under which to arrange them; whereas the botanist has twenty-four classes divided into innumerable orders, which shortens his labour wonderfully. This is a powerful plea for the adoption of new orders, where nature leads the way; and I think if each order were divided into denominate sections (by which I mean sections that have a name) it would be a great improvement, and very much facilitate the study of this science. M. Latreille has led the way here, and done much for us, but, as is often the case with new inventions, his system is not sufficiently simple for general use: his names, likewise, have not that harmony and uniformity of termination which is necessary to make them easily retained by the memory. If we adopted a patronymic appellation for these sections, for instance, Coleoptera *Scarabæidæ*, Coleoptera *Staphylinidæ*, Coleoptera *Sphæridiadæ*, Orthoptera *Gryllidæ*, &c. it would be liable to no objection of this kind: and the subsections, rather than the primary ones, might be founded upon the number of the joints of the tarsi, and those genera that are nearly related, for instance *Aleochara* Gravenh. and *Pselaphus* Fab. might be kept together, instead of being placed widely asunder, as they are upon the present system.

* *Fn. Etrusc. Mantiss. Append. p.* 114.

† *Insectum novi generis Ichneumoni proximum*, ibid.

this tribe, at which time, and till very lately, I was unacquainted with this discovery of Rossi's, I observed that it was doubtful to what order it ought to be referred*, though I was unwilling at that time to speak too positively on the subject. The opinion to which I then inclined has lately received full confirmation from one of the most experienced and able entomologists of the present day, M. Latreille, who thus, in one of his last works, expresses himself upon this subject: "*Insectum prorsus singulare* (Stylops Melittæ *Dom. Kirby*) *a Dom. Brebisson accepi. Systemata entomologica perturbare videtur, cum ex omnibus ordinibus repellatur.* Xenos Vesparum *Rossi animal præcedenti affine et animum pariter excrucians. Tempus ducamus et dies alteri lucem afferrent*†." The time he predicts in the latter part of this paragraph seems now arrived; for, if any shadow of doubt or hesitation remained in my mind, it has been dispelled by my valuable friend and correspondent the learned and ingenious Professor of Natural History in Harward University, Cambridge, New England, William Dandridge Peck, Esq.‡ who has sent me specimens of an insect of this tribe still more singular and wonderful in its structure than my *Stylops Melittæ*, and which appears to be of the same genus with Rossi's *Xenos Vesparum*, although, as far as I can judge from his description, a distinct species: this he has accompanied by elegant drawings both of the larva and perfect insect, and such observations as he had an opportunity of making; from which, I think, it will clearly appear, every circumstance being taken into consideration, that these insects cannot with propriety be referred to any existing order. To make this evident to the satisfaction of entomologists, I shall begin by stating these observations, as nearly as possible, in Professor Peck's own words, and next endeavour to point out those peculiarities which, in their different states, distinguish them from those of every other order, and establish their claim to be placed in one by themselves.

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* *Monogr. Ap. Angl. vol.* ii. *p.* 112.

† *Genera Crustac. et Insect. tom.* iv. *p. ult.*

‡ This gentleman has published an admirable little tract, in which he gives, in the manner of Reaumur and De Geer, the history of a *Tenthredo* that infests the cherry-trees in New England; which shows that, had he leisure to devote himself more to Entomology, he would enrich that science with invaluable treasures. This little work is entitled *The Natural History of the Slug-worm.* Boston, 1799, pp. 14.

Professor Peck's letter is dated September 21st, 1809; but, from some unknown cause, I did not receive it till nearly a year after its date. He thus introduces the subject before us:

"The study of insects would be delightful to me, if my other employments would permit me to pursue it steadily. The contemplation of their infinite variety of forms, and the unspeakably wonderful contrivance of their mechanism, irresistibly attract attention; but the great object is to know, as far as possible, for what use these living machines were made, the metamorphoses they pass through, and the means they instinctively use for the preservation of their race. When we know these, our curiosity is gratified, our admiration increased, and we feel and exclaim, '*Eminet in minimis maximus ipse Deus.*'

"One of the most curious of all insects is your *Stylops;* and I heartily wish you may be able to find more specimens. Your having met with the remains of *Stylops* in foreign *Vespæ*[*] made me determine to look for it in those of this country, and I have had the pleasure to find it in a species that is here the most abundant[†]. The abdomen of the *Vespæ* is so distorted by the *Stylops* that I have no difficulty in knowing them when on the wing. Taking them with the gauze forceps, bringing them into a close room, and permitting them to fly to the windows, I caught them again with a wine-glass and a card, fed them with sugar, and thus preserved them till their parasites were disclosed. I had not the pleasure to see them emerge, but found them soon after. I obtained four in this way, and brought several nests of the *Vespa* into the house, taking them in the night when all the inhabitants were at home, in the hope of obtaining more; but I got no living ones. This year I have not taken one, for want of time to attend to it.

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[*] *Sowerby's British Miscellany, no.* ix. *p.* 94.

[†] *Vespa fuscata. Fabr. Ent. Syst. Em.* ii. 260. 27. *Polistes fuscata. Syst. Piez.* 270. 4. TAB. VIII. *fig.* 6.

" All I know of this *Stylops* was picked up in a few days that I passed at my little place at Newbury, about forty miles from this. The form of the larva will be seen at fig. 1. and fig. 3. In the feeding state the head is near the base of the abdomen of the wasp, as I found by dissection. When the feeding state is passed, it is easy to conceive that it turns, and with its flattened head separates the membrane which connects the abdominal scuta, and protrudes itself a little way, accurately closing the aperture, which is but just large enough to admit it. All this time the wasp is active, and associates with its companions. When just protruded the head of the larva is of a pale brownish colour; by degrees it assumes a rounder form, and becomes almost black.

" The chrysalis state ensues; but I suspect that only the part exposed to the air, and that immediately under the pressure of the abdominal ring, becomes hard.

" My four *Stylopes*, I concluded at the time of sketching the figures, were males; they were all alike. The last segment of the abdomen in the male of the larger *Cicadæ* is joined to the penultimate one somewhat as in this; but in *Cicada* it is only a kind of operculum. In the *Stylops* the last portion of the abdomen appears to be an organ of importance in its œconomy: it terminates in an acute point, which stands at right angles nearly with its longer part or shaft*: but without seeing the other sex I cannot determine what it is. Is it a kind of aculeus for depositing its eggs in the larva *Vespa*†? for it is in the larva that the eggs are probably deposited‡.—The *Stylops* of the wasp has no mouth that I could find; there is indeed a depression a little anterior to the maxillæ§ (*Mandibulæ* in Fabrician dialect), but it is transverse! It therefore probably does not feed in the perfect state, like some *Phalænæ*, and only continues the species. There is one particular in its manners which tends to strengthen this opinion. I have noticed in many *Phalænæ elingues*, and indeed in some others, but especially in those, that, whenever they alight, their wings are continually in a tremulous motion, particularly in the males, whether the insect is running briskly or standing still. These, be assured, are the tremblings of eager desire. So my *Stylops*, which I confined under a watch-crystal, coursed round its prison with surprising trepidation as long as it lived, which was but a few hours. This insect is so exceedingly uncommon in its structure, that I know not in what class *(order)* to place it, till I have seen both sexes, and examined more insects than I have yet been able to do.—'*Mihi contuenti*,' says Pliny, '*persuasit res ipsa naturæ, incredibile nihil existimare de eâ*." What can be said to this insect? The more I consider it, the more I wonder it is so very extraordinary. What can be the use of the mandibulæ, for such they certainly are? They are not strong enough to cut its way through the paper cells of the wasp's comb; can they be useful in opening the sides of the larva for depositing the eggs?"

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* *See* Tab. VIII. *fig.* 14. Tab. IX. *fig.* 14. 15.

† From this organ, which seems rather an oviduct, I apprehend Professor Peck's specimens were females.

‡ Reasoning from analogy, it seems not probable, though I formerly inclined to this opinion, that the egg should be laid in the wasp in its first state, and the *larva* feed on it in its last. Rossi, however, was of this opinion; for, speaking of his *Xenos Vesparum*, he says, "*Cui vespæ larva antequam cellulæ clauderentur forte incunabula dedisse videtur*."

§ Mr. Spence and myself, in compliance with the custom universally adopted abroad, though we are of opinion that the terms should rather be reversed, in order to prevent the confusion which must arise from employing different words in different countries to denote the same parts, have agreed to use *Mandibula* and *Maxilla* in the Fabrician sense.

Thus far my ingenious correspondent: I shall now notice the particulars which Rossi has detailed as observable in the species he discovered, *Xenos Vesparum*, which although parasitic in the same tribe of insects, as far as I can judge from his figure* and description, appears to be a distinct species from Professor Peck's, if indeed it belong to the same genus.

It inhabits, he says, *Vespa gallica*, in which it is frequently found; and *V. sexfasciata*, with some other more minute species, are also infested by a similar foe, but whether the same he had no opportunity to ascertain. The individuals inhabited by the *Xenos*, he observes, are readily known by the unnatural swelling of the fourth segment of the abdomen, from which the insect in its pupa state usually emerges, sometimes one, often two, and now and then even three in the same wasp. The imago or perfect insect generally comes forth in August and September; and if about that time the pupa be extracted with a needle from the abdomen of the wasp, and its covering being broken, if it be carefully stripped of its white tunic, living specimens may be obtained. Perhaps the egg of this animal is laid in the larva of the wasp before its cell is closed. It is wonderful that the *Vespæ*, after supporting one or more of these insects, should survive; yet they are often met with having only the exuviæ of the *Xenos* remaining in them, and are nevertheless sufficiently active. Perhaps the time this insect remains in the larva state is very short, and the thorax of the wasp not being attacked by it, may be the reason why it escapes with life.

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* *Fn. Etrusc. Mantiss. tab.* vii. *fig.* B. *b.* This figure is a very indifferent one, and conveys no clear idea of the insect, at least, if, as seems most probable, it be congenerous with *Xenos Peckii.*

Having given the above abstract of the observations of Professor Peck and Rossi on this tribe of insects, I shall now assign, more in detail, the reasons which have induced me to consider the genera of which it is composed as belonging to a new order, beginning with their preparatory states; for, if we would ascertain this point legitimately with respect to any description of insects, a due share of attention and weight ought to be allowed to the metamorphosis; for although I would not, with Swammerdam, Lyonet, and Bonnet, build a system solely on this foundation, (since this, in some cases, would unite in the same order insects that are widely different in their perfect state, and separate those that are nearly related*,) at the same time, taken in conjunction with the characters of the perfect insect, it is often of great use in ascertaining the order to which any genus belongs. In having recourse to it certain rules, for the proper application of it, should be laid down and adhered to: I will venture to lay before the Linnean Society some that appear to me open to little or no objection.

RULE I. *When an insect, in its perfect state, combines the characters of two or more orders, (unless it be deemed adviseable to place it in an order by itself,) it should arrange with those whose metamorphosis is the same.*

Example.—Forficula exhibits the characters both of *Coleoptera* and *Orthoptera*; but its metamorphosis being that of the latter, unless placed in a new order, its station should be in it.

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* *Coleoptera, Hymenoptera,* some *Neuroptera* and *Diptera* agree in their metamorphosis, and again *Culex, Tipula* Linn. &c. are widely separated in this respect from those of that order whose metamorphosis is *coarctate*.

Rule II. *When an insect possesses the characters of one order and the metamorphosis of another, in this case it should follow the characters.*

Example.—Myrmeleon and *Hemerobius* clearly exhibit the characters of *Neuroptera;* yet their metamorphosis is that of *Coleoptera*, *Hymenoptera*, and many *Diptera*, except that their pupa (as is also the case with *Hydrophilus*) is inclosed in a cocoon spun by the anus of the larva.

On this rule we may observe that, since the perfect state is the grand consummation of the insect to which all its other states are subordinate and subserve, this state therefore ought to be the principal regulator of its station.

Rule III. *Where an insect exhibits the metamorphosis of an order, or of a section of it, but none of its characters, nor those of any other order, it should not on that account be arranged in such order, but on the contrary form a distinct one.*

Example.—The metamorphosis of *Coleoptera*, *Hymenoptera*, and many *Diptera* is *incomplete*, yet on account of the characters of the imago they are properly placed in different orders. This rule also applies to *Stylops* and *Xenos*.

Rule IV. *Where the genera which compose an order have invariably one kind of metamorphosis, no insects that vary from it in that circumstance should be placed in it, unless they exhibit a perfect agreement with it in characters.*

Example.—In the *Coleoptera* and *Hymenoptera* the metamorphosis is invariably *incomplete*, and therefore *Forficula*, whose metamorphosis is *semicomplete*, and *Stylops* and *Xenos*, whose metamorphosis comes nearest to *coarctate*, since they differ in several characters from the perfect insects of those orders, should not arrange with them; while *Myrmeleon* and *Hemerobius*, though they differ from the general metamorphosis of the *Neuroptera* order, should nevertheless be arranged in it, since they agree with it in characters.

Upon comparing together Professor Peck's account and figures of the larva of *Xenos Peckii* (for so I call his insect) I at first imagined that it was of that order of larvæ, which, having a membranaceous or rather fleshy head, can lengthen or shorten it at pleasure, like the larvæ of many of the *Muscidæ;* for, if (TAB. VIII.) fig. 3. be compared with fig. 4, the head in the latter seems proportionally longer than in the former: but yet, as fig. 4. is more highly magnified than fig. 3, perhaps this appearance may be merely the result of that circumstance and of a lateral view. Some doubt, however, must remain with respect to this point; and should my first suspicion be confirmed, it would show a considerable affinity between the larvæ we are speaking of, and those of many of the *Diptera* whose metamorphosis is *coarctate.* Professor Peck further observes, which throws some additional weight into this scale, that the head of the larva, previous to its assumption of the pupa, takes a rounder form. There are, however, no traces in either figure, of the unguiform mandibles with which larvæ of this description are usually armed, nor any appearance of the anterior and posterior spiracles (the latter in two plates in two anal cavities) which commonly distinguish them: so that, did I know only the larva, I might perhaps be inclined to conjecture that the metamorphosis of these insects is *incomplete;* for I can discover no conclusive characters in the larva itself, as far as I can get an idea of it from Professor Peck's figures and observations, to ascertain satisfactorily the kind ot its metamorphosis: but with respect to the pupa the case is different; for since I have examined *Stylops Melittæ* in this state, I can here speak with more confidence. These pupæ exhibit no trace either of wings, antennæ, palpi, or legs[*], under their envelope, so that they appear to come nearest to the *coarctate* metamorphosis, but with this difference, that the head-case is distinct from that which covers the rest of the body. In this kind of metamorphosis also the skin of the larva usually hardens and forms a cocoon, in which the parts of the future imago are developed; but whether, in the order of insects we are considering, the pupa rejects or retains the skin of the larva, is not clear. From Rossi's observations it should seem that the insect is enveloped by a double integument[†], the exterior of which may be analogous to the cocoon formed by the skin of the larva, and the interior to the membrane in which even a *coarctate* pupil is inclosed: that part of the body, however, which remains inserted in the body of the *Melitta* or *Vespa* is soft and fleshy, while the head and neck, being exposed to the air, become hard and corneous. One peculiarity observable in the pupa of Professor Peck's species would seem to imply that it does reject the skin of the larva, at least as far as the head is concerned, for the eye-covers (a part, to the best of my recollection, peculiar to this insect,) are set with pellucid hexagons[‡]; which looks as if they were intended by the all-wise Author of nature to transmit some light to the insect when in the pupa state: it is evident by an inspection of Professor Peck's figures 3 and 4, that the larva has nothing of this kind; therefore the skin, at least of the head, must be cast.

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[*] TAB. IX. *fig.* 17. This figure was taken from a specimen, the only one I could procure, that had been long extracted from the body of a *Melitta*.

[†] *Hæ pupæ, si acûs ope e loco penitus extrahantur, abruptoque tegumento leniter deinde tunicâ seu veste albâ propriâ exuantur.* Rossi.

[‡] TAB. VIII. *fig*. 7.

The metamorphosis then of these insects, though, in an improper sense, it may be denominated *coarctate*, is, strictly speaking, different from that of every other known order, and something intermediate between *incomplete* and *coarctate*. Even from this view of the subject it appears, I think, with no slight degree of evidence, that their claim to stand by themselves as a distinct order is very strong.

But this will be demonstrated more satisfactorily when we consider the many extraordinary and unique characters exhibited by these insects in their perfect state. I shall first call the attention of the entomologist to those organs from which, in the Linnean system, the characters and denominations of the orders are chiefly taken; I mean the elytra and the wings.

The three first orders only are distinguished by elytra or hemelytra; there is no necessity, therefore, to compare our insects in this respect with any other; and since all the true *Hemiptera* take their food by suction by means of an oral or pectoral rostrum, which forms one essential diagnostic of the order, these also may be put out of the question, the *Stylops* tribe having mandibles and palpi and no rostrum.

The elytra of the insects in question, as to their substance, agree certainly with those of many *Coleoptera*, being soft, flexile, and coriaceous, as is the case with *Cantharis* and others*: but in situation, direction, and connection they differ from every *Coleopterous* and *Orthopterous* genus. With respect to situation, they are placed very near the head of the insect, not on the back, but, which is a circumstance most singular and without parallel in the entomological world, apparently attached to the coxæ of the anterior pair of legs*: whereas in *Coleoptera* and *Orthoptera* their point of attachment to the trunk is dorsal, by means of an apophysis or kind of pivot, which acts under the posterior part of the thoracic shield; and they cover the back; the wings, where they exist, for the most part entirely, though in some few genera only partially†; and the abdomen. In connection also and direction they are quite unique, there being nothing at all similar to them in any order; for they are entirely and widely separated from each other, coming in contact in no one part, at first receding from the body, then curving towards it, and lastly diverging from it again‡, so as to give them the appearance of distortion. In *Coleoptera* it is well known, with the exception of *Melöe* Fabr. (the elytra of which diverge from each other considerably, though at the base one laps over the other) that, when closed, they unite together at the longitudinal suture§. In all the *Orthopterous* genera one elytrum laps more or less over the other||; in a few species of *Phasma* and in *Acrydium* the elytra are very minute, and may perhaps be deemed more analogous to those of *Stylops* and *Xenos*; still, even in these cases, when closed they cover the base of the wings, are dorsal, and remote from the head. The elytra, therefore, now under consideration, whether we advert to their situation, direction, or connection, cannot be regarded as indicating the arrangement of these insects under any of the present orders.

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* Viz. The *Malocodermi Latr. Gen. Crust. et Ins.* i. *Insecta Pterodicera Ord.* i. *Fam.* v. *p.* 252—268.

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* TAB. IX. *fig.* 2. This discovery I owe to the accurate eye of Fr. Bauer, Esq. of Kew Green, who has been kind enough to enrich this paper with such a drawing as I believe has scarcely a parallel in Entomology.

† *Molorchus*, for instance, *Necydalis*, *Atractocerus* Latr. *Malthinus* Latr. and *Phasma*.

‡ TAB. VIII. *fig.* 15. d d.

§ They diverge from each other also in some other genera, *Necydalis* for instance, though not so much as they do in *Melöe*.

|| *Forficula* in this respect appears to agree with the *Orthoptera*.

The wings next claim our attention: these have nothing in common with the *anelytrous* orders, differing from them in figure, substance, and in veins*: therefore the *Stylopidæ* cannot belong to the *Hymenoptera*, amongst which Rossi has placed them, led doubtless by the single circumstance of the larvæ being parasites in a living insect. But this is certainly not a sufficient reason for placing them in this order, since *Musca larvarum* and other *Diptera*, whose larvæ also inhabit living insects, might on the same account be placed in it. The wings should be considered as to their situation, substance, figure, folding and veins. With respect to the first, situation, they are inserted at a much greater distance from the point of attachment of the elytra than takes place in any of the other elytrophorous insects: in substance they are very similar to those of many of the *Hemiptera*, a little thicker than in *Coleoptera* and *Orthoptera*, where the wings are pure membrane. In shape the wings approach to those of *Orthoptera*, being, as nearly as may be, a quadrant of a circle*: in this respect they differ considerably from *Coleoptera*, the wings in this last order being usually semicordate or semiovate. They fold longitudinally, in which circumstance they likewise agree with *Orthoptera*. In *Coleoptera* there is commonly an oblique fold at the base, where a portion of the inner part of the wing laps underneath, and a transverse fold in the middle or near the apex†. The veining of the wings is very simple; a few longitudinal diverging nerves constitute the whole apparatus necessary to keep these ample wings sufficiently extended for the insect's purposes; in this they somewhat resemble the coleopterous genera *Hister*, *Necrophorus*, and the *Staphylinidæ*, (though in these the veining is rather more complex,) but are quite different from the *Orthoptera*, the wings of all the genera in that order, when *Forficula* is excluded, having numerous longitudinal veins crossed alternately at right angles by an infinity of transverse ones, so that their reticulations, or little squares, are usually arranged like bricks in a wall: in *Forficula*, indeed, the nerves are chiefly longitudinal, but they are all connected near the margin by a transverse one which surrounds three-fourths of the wing.

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* The veining of the wings, under certain restrictions, has been assumed as affording fundamental characters of an arrangement of the *Hymenoptera* and *Diptera* orders, (which he gives as a new idea,) by the ingenious and learned Professor Jurine, of Geneva, in a work recently published entitled "*Nouvelle Méthode de classer les Hyménoptères et les Diptères.*" This excellent author, when he says "*Aucun auteur, à ce que je crois, n'a examiné avec assez d'attention ces parties pour y trouver les bases d'une méthode qu'on pût leur appliquer,*" (*Introduct.* p. 2.) seems not to be aware that a British Entomologist was the real inventor of such a system. But it is but justice to claim for our countryman the honour to which he is entitled; and I do this without the smallest wish to derogate from the merits of Professor Jurine, who in the work just alluded to has proved himself one of the first Entomologists of the age. The following are Harris's own words: "I have kept close to the outlines of the system of Linnæus, so far as his method was agreeable to, and did not interfere with, the plan which I have adopted, of a strict adherence to a *natural system,* separating the classes by such nice though strong distinctions, that the observer at first sight of an insect (if it be of the *Diptera* or *Hymenoptera*) shall be capable of not only knowing the class that it refers to, but at the same time to what *order* and *section* of that class, and this by the *wings* only.

"It is to the *tendons* of the *wings* that I am beholden for the discovery of the numerous species (particularly of the *Musca*) contained in this work; for, having collected on a certain time a great number, I wanted to separate the species, and take away the duplicates, but knew not where to begin for want of some plan or method to proceed upon, and such a one as would effectually prevent the taking a male and a female of one kind for two distinct species. I at length perceived, by the different disposition of the *tendons*, that there were a certain number of *orders* or sorts of *wings*, and immediately proceeded to divide them respectively. Thus the difficulty was unravelled; for it was now but a pleasing task to select the various species of each order, male and female, and place them together. It was therefore a prevailing circumstance with me to insert drawings of the *wings* according to their various *orders*, that whoever may intend to collect the *Diptera* and *Hymenoptera* for the future, may have the opportunity of the same benefit and assistance from them which I have experienced."—*Harris's Exposition of English Insects, Introduct.* p. i. ii.

Harris was evidently illiterate, and therefore could not give that form to his ideas that a man of better education would have done; but he was an attentive observer of nature, and as such is entitled to the merit of his own discoveries.

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* TAB. VIII. *fig.* 15. gg.

† This takes place even in *Molorchus*, whose wings are very little covered by the elytra; but in some *Buprestides (B. vittata)* the transverse fold seems not to take place. See also *De Geer*, *tom.* iv. *p.* 125.

From the peculiarities here stated, I trust I have made it evident, as far as the elytra or the wings are concerned, that these insects will not arrange under any of the present orders.

I shall now say something on the remaining characters of the *Stylopidæ*, beginning with what Mr. Spence and myself, in our proposed elementary work, have denominated *Trophi* (Feeders)*. Upon these the Fabrician orders are professedly founded, and therefore this will enable us to judge whether our insects will arrange under any of them. The whole of the orders established by that system may be divided into two principal classes; those that masticate their food, or at least have mandibulæ and maxillæ, and those that imbibe it by suction; in the first we have *Eleutherata*, *Ulonata*, *Synistata*, *Piezata*, *Odonata*, *Mitosata*, *Unogata*, and all the *Crustacea*. The characters of this class are all taken from the maxilla or under-jaw: under the second, the suckers, are arranged the *Glossata*, *Ryngota*, and *Antliata*; the characters of these are taken from the tongue or haustellum, which is another name for it. Now in the insects in question, the *Stylopidæ*, neither maxillæ nor tongue are discoverable; they are armed indeed with what, as well as Professor Peck, I am disposed to consider as mandibulæ or upper-jaws, but which are not formed for mastication; these mandibulæ, unlike all others, are fixed in the head on its under-side, between the palpi at their base†, a circumstance which induced me formerly to consider them as analogous to the labial palpi of Latreille: these palpi, which are biarticulate and very conspicuous, appear to be inserted in the head itself just exterior to the mandibulæ. In my specimens, which are in an imperfect state, I have not been able to detect any mouth or lips, though there is something like an upper lip in *Stylops Melittæ*; and Professor Peck could see nothing but a depression under the head*, though he had the advantage of recent specimens. So that the catalogue of the parts of the mouth is short indeed; mandibulæ only, and what may be regarded as analogous to maxillary palpi; and these situated, both with relation to each other and to the usual place of the same organs in other insects, in a manner perfectly unique and peculiar. This tribe, therefore, seems to be intermediate between the two grand classes above alluded to, the masticators and suckers, and to belong to neither; and therefore cannot be arranged in any of the Fabrician orders.

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* Fabricius names the parts in question *Instrumenta cibaria;* but having laid it down as a rule not to employ compound terms, where it was possible to avoid it, except to express qualities, we have substituted the above for those of Fabricius.

† Tab. VIII. *fig.* 9. a.

I shall now advert to such of their remaining characters as are most peculiar and remarkable. Their antennæ in this respect first catch our attention, which after two or three common joints divide into two branches nearly equal in length, thus giving the insect a very unusual appearance†: but this circumstance, singular as it is, is not altogether peculiar to this tribe; many both coleopterous and hymenopterous insects have branching antennæ; their branches, indeed, are commonly lateral processes issuing from a main stem, but in *Tenthredo furcatus*‡ they are equal branches; in *Gyrinus* the antennæ also are bipartite, only one lobe is shorter than the other and differently shaped, yet both spring from a common joint embedded in the head*. The most striking peculiarity, however, exhibited by our *Stylopidæ* are their eyes, not so much on account of their being placed on a pillar or foot-stalk, a character they possess in common with several other insects†, but from the unusual circumstance of their having the hexagonal lenses of which they are composed separated from each other by a septum or partition, which being elevated above the lenses gives the eyes a cellular surface, so that under a good magnifier they have somewhat the appearance of diamonds set in jet or ebony‡: these lenses are also very much larger and infinitely less numerous, especially in *Xenos*, than they are in other insects that have compound eyes. The eyes of these insects, therefore, are of a very unique description, differing from all other compound eyes in having these septa, yet not the same as the aggregate eyes that distinguish some apterous genera§, which are merely a number of simple hemisphærical eyes, like those of spiders, collected together, and not hexagonal lenses as in the insects in question. I shall next notice a circumstance which at once distinguishes them from all *Coleoptera* and *Orthoptera*, and gives them some affinity with *Hymenoptera*, I mean a narrow collar|| instead of an ample thoracic shield: the piece, however, which follows this¶ is quite unlike the part analogous to it in *Hymenoptera*, in which order it is usually taken, but improperly, for the thorax, since it does not answer, as the

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* TAB. VIII. *fig.* 9. c.

† TAB. IX. *fig.* 10. b. c. *fig.* 11. 12. *Kirby Monogr. Ap. Angl. tom.* i. *tab.* 14. *no.* 11. *fig.* 3. 4. *Sowerby's Brit. Miscell. no.* 9. *plate* 45. *fig.* 5. a a. b b.

‡ *Coquebert Illustr. Ic. Dec.* I. *tab.* iii. *fig.* 4.

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* Tab. IX. *fig.* 13.

† Many of the *Crustacea*. Many male *Ephemeræ*, which besides the common compound eyes and stemmata have also columnar ones, and several *Cimicidæ*. See *De Geer, tom.* iii. *p.* 338. 343. *plate* 34. *fig.* 17. 18. 24. 25.

‡ Tab. IX. *fig.* 10. d d.

§ *Oniscus* Latr. *Iulas,* and *Scolopendra.*

|| Tab. VIII. *fig.* 15. b.

¶ *Ibid.* c.

best entomologists have observed, to the thorax in *Coleoptera*. This piece Mr. Spence and myself have agreed to name *Dorsolum* (dorslet); it exists in all the insects of that order, only it is covered by the thorax, and is that part to which the base of the scutellum is united[*]: next follows what answers to this latter part in other insects[†], in form not very unlike the scutellum of *Coleoptera*, but situated so near the head, that at first no one would take it for that part. That this is the scutellum is evident from its situation between the elytra and the wings, and from its being the third piece of the back of the trunk: this piece is commonly followed by another narrow one, which we have called *Postscutellum*[‡]; but this is obsolete in this tribe. The piece which next succeeds[§] constitutes the principal and most conspicuous part of the back of the trunk, but in other insects forms only its declivity towards the abdomen[||]; we denominate the whole *Lumbale;* it consists of the *Lumbi*[¶] and *Interlumbium*[**]; next follows what we have named *Postlumbium*[††]: the scutelliform process which succeeds this[‡‡] seems quite unique and peculiar to these insects; it is what I formerly mistook for the scutellum[§§], but it is certainly not analogous to that part. The postlumbium in *Coleoptera* and many other insects is followed and the trunk terminated by a cleft process that separates the upper part of the cavity of the trunk from that of the abdomen, which from its figure we have denominated *Nates*[||||]: but this piece being covered by the first segment of the abdomen, can scarcely be deemed analogous to the process which, in the *Stylopidæ*, terminates the trunk and covers the abdomen. I shall call this ano-

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[*] Tab. IX. *fig*. 16. a.

[†] *fig*. 1. e.

[‡] *fig*. 16. c.

[§] *fig*. 1. ffh.

[||] *fig*. 16. dde.

[¶] *fig*. 1. ff. and *fig*. 16. dd.

[**] *fig*. 1. h. and 16. e.

[††] *fig*. 1. i. and *fig*. 16. f.

[‡‡] *fig*. 1. 2. k.

[§§] *Mon. Ap. Ang. tom*. ii. *p*. 113.

[||||] Tab. IX. *fig*. 16. g.

malous part the *Proscutellum.* The different pieces which compose the underside of the trunk exhibit no very peculiar characters except those remarkable processes which, projecting out on each side from under the body, form, in conjunction with the proscutellum, a kind of rampart to enclose and protect the base of the abdomen ; and within which, at least in the case of *Stylops Melittæ*, it appears to be retractile. These processes[*] are equivalent to what we denominate *Femoralia* in many insects, but they are unlike those of any I ever met with. In the legs there is this remarkable, that the trochanters[†], especially in the four anterior legs, are much larger than the coxæ[‡], in which the latter are not easily detected. The tarsi, which have only four joints, are distinguishable from those of most other insects from their being without claws ; for what Mr. Sowerby and I, in *Stylops Melittæ*, mistook for claws[§] was merely the bifid apex of the terminal joint[‖]. Another remarkable circumstance renders the tarsi in both these genera conspicuous, the underside of the three last joints is covered by large membranaceous hairy vesicles[¶], which, as I gather from Professor Peck's figure[**], in the living or recent insect are inflated ; but in old specimens, the air escaping, they become flaccid, and look rather like an appendage than a part of the foot. De Geer has observed, both with respect to *Thrips physapus* and several *Acari*[††], that their foot is terminated by a vesicle. And, lastly, to close this long discussion, the last ventral segment of the abdomen ends in a reflexed process[*], which has nothing parallel to it in any other order.

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[*] Tab. IX. *fig.* 1. 2. 11. *fig.* 5. b b. *fig.* 6. a a.

[†] *Fig.* 2. u. q. *fig.* 3. e. *fig.* 5. d d. *fig.* 6. c c. *fig.* 7. a.

[‡] *Fig.* 2. t. 3. d. 5. cc. 6. b.

[§] *Mon. Ap. Angl.* i. *tab.* 14. *n.* 11. *fig.* 1. *Sow. Brit. Miscell. n.* 9. *pl.* 45. *fig.* 4.

[‖] Tab. IX. *fig.* 9. a.

[¶] *Fig.* 8. 8. c.

[**] Tab. VIII. *fig.* 13.

[††] *Tom.* iii. *p.* 7. *pl.* i. *fig.* 1. ppp. *Tom.* vii. *p.* 84. *pl.* 5. *fig.* 6. 7. l. and *fig.* 19. n.

From the above observations I trust it will appear with sufficient evidence, that insects which exhibit so many peculiarities in their first, middle, and final state, are by such singularity of metamorphosis and conformation entitled to the distinction of forming a new order in an Entomological System.

But perhaps it may be objected, that it is scarcely worth while to form a new order for the sake of two genera only, and that it would be better to refer them to that, amongst those already established, with which they are most nearly connected. It will be sufficient to observe by way of reply to this objection, that this is not usually done even in an artificial system; for every botanist knows that many of the Linnean orders originally consisted of only single genera, and that some of the classes themselves included very few: thus, for instance, *Heptandria* had only three genera in two orders, and *Dodecandria* seven genera in five. Much less is it allowable in a natural system, the object of which is to discover the laws established by the Creator of all things, and to point out and adhere to those boundaries by which he has separated one order of beings from another: and the Linnean system of Entomology is a near approach to the natural system, although still capable of improvement. Whoever, therefore, upon good and sufficient grounds, establishes a new natural order, does his part towards carrying it to that perfection of which it is susceptible.

It now remains that I propose a denomination for this new order, assign to it its place, and lay down its characters and those of the genera which belong to it. *Strepsiptera*[†] is the term I propose by which to designate the order, which name I have given it on account of its distorted elytra. With respect to the place of *Strepsiptera* in the system, it seems to me that this order should follow *Coleoptera*; for, its metamorphosis being different from that of *Orthoptera* and *Hemiptera*, and nearer to that of *Coleoptera*, this seems its most natural station, considered as an elytrophorous order, especially, since, if it be inserted between *Orthoptera* and *Hemiptera*, with both of which it has some affinity, it would interrupt the series of *semicomplete* metamorphosis, by which, besides other characters, those two orders are so closely united.

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[*] Tab. IX. *fig.* 14 and 15. b.

[†] Them. στρεψις and πτερον.

I shall next attempt to lay down in detail the characters by which the *Strepsiptera* are distinguished, giving an *artificial* and *natural* as well as an *essential* character of the order: the second of these, the *natural* character, I shall endeavour so to construct as to include all such features as are common to the two genera of which the order at present consists; but I must first observe, that a describer of these insects, who would wish to get an accurate idea of all their characters, labours under considerable disadvantages, not only from the minuteness of the animals, but also from their dark opaque colour and velvet appearance, which conceal the sutures of many parts of the body altogether, unless they are viewed under a powerful magnifier with a strong light thrown upon them: and few, like myself, can possess the advantage of the eye and luminous pencil of a Bauer.

INSECTA.

INSECTA. ORDO II.

STREPSIPTERA.

Character Essentialis.

Elytra lateralia alas haud tegentia.

Character Artificialis.

Elytra antica lateralia distantia distorta coriacea alas nullo modo tegentia.

Alæ omninò apertæ radiatæ* longitudinaliter plicatiles.

Abdomen trunci processu corneo seu proscutello supra munitum.

Character Naturalis.

CORPUS oblongum vel lineari-oblongum, subcylindricum, cute corneâ cataphractum.

CAPUT sessile, trunco latius, transversum, magnum†.

Os cum *Labro Labio* et *Maxillis* obsoletum et vix ullum‡.

Mandibulæ duæ corneæ elongatæ, lineares, angustissimæ, edentulæ, apice forficatæ acutæ, sub capite apud basin palporum intus insertæ§.

Palpi duo biarticulati, valde distantes, sub capite inserti‖.

Antennæ inter oculos in acetabulo frontis insertæ: basi stipite communi crasso bi- vel triarticulato, articulis brevissimis, ramis duobus elongatis terminato, unde bipartitæ evadunt¶.

Oculi apophysi pedicellari laterali brevi crasso cylindrico capitis adnati, magni, hemisphærici, ex pluribus hexagonis crystallinis planiusculis septo elevato sibi invicem separatis, unde et cellulosi, constantes[*].

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* By this term I mean to signify that the nerves diverge like rays.

† TAB. IX. *fig.* 10. ‡ TAB. VIII. *fig.* 9. c. § *Ibid.* a. ‖ *Ibid.* b.

¶ TAB. IX. *fig.* 10. b c. 11. 12. *Brit. Misc. ubi supra, fig.* 5. a b.

Vertex pone columnos oculiferos plagâ elevatâ utrinque notandus[†].

TRUNCUS oblongus[‡].

Thorax collariformis, brevissimus, transversus[§].

Dorsolum transversum, breve[‖].

Scutellum subtriangulare[¶].

Postscutellum obsoletum.

Lumbi magni, latera trunci fere tota occupantes, subrhomboidales, convexiusculi: lateribus deflexis concavis[**].

Interlumbium triangulare: vertice acuminato[††].

Postlumbium declive aut verticale[‡‡].

Proscutellum conicum, subcalceoliforme, productum, convexum, ascendens, abdominis basin obumbrans et muniens[§§].

Pectus et *Sternum* sub pedibus anticis delitescentia vix discernenda.

Peristethium (*Illiger*) a pedibus intermediis omnino occultatum.

Scapularia (*Illiger*) subtriangularia, ante basin alarum posita[‖‖].

Pleuræ (*Illiger*) longitudinales, latiusculæ et ferè lanceolatæ[¶¶].

Parapleuræ (*Illiger*) longitudinales, sublineares, anticè attenuatæ, apice subclavatæ et inter basin alarum et scapularia interpositæ, pleuris a parte inferiori parallelæ[*].

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[*] *Brit. Misc. fig.* 4. aa. TAB. IX. *fig.* 10. dd.

[†] *Ib.* ee.

[‡] *Fig.* 1. bcdefghikl.

[§] *Ibid.* b.

[‖] *Ibid.* c.

[¶] *Ibid.* e.

[**] *Ibid.* and *fig.* 2. ff.

[††] *fig.* 1. h.

[‡‡] *Ibid.* i.

[§§] *Ibid.* and *fig.* 2. k.

[‖‖] *fig.* 4. c.

[¶¶] *Ibid.* d.

Mesostethium (*Illiger*) amplum, subpanduriforme, posticè medio longitudinaliter canaliculatum: *Mediosterno* aut *Poststerno* extante nullo[†].

Femoralia magna, crassa, apice rotundata, posticè attenuata, basi gibba, abdomen utrinque munientia[‡].

Elytra coxis pedum anticorum, ut videtur, affixa, coriacea, linearia vel ferè cochleariformia, a corpore primùm divergentia, iterum id versùs incurva, et demum recurva, unde quasi distorta evadunt, alas nullo modo tegentia[§].

Alæ amplæ, submembranaceæ, circuli quadrantis figurâ æmulæ, longitudinaliter plicatiles, radiatæ, sive nervis omnibus simplicibus divergentibus[||].

Pedes longitudine subæquales, compressi: anterioribus 4 approximatis; posticis 2 remotis.

Coxæ 4 anteriores brevissimæ et difficillimè distinguendæ; posteriores 2 longiores magis conspicuæ[¶].

Trochanteres femorum basin omnino intercipientes: anterioribus 4 elongatis magnis; posticis 2 brevioribus[**].

Femora ferè semiovata[††].

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[*] TAB. IX. *fig*. 4. e.

[†] *fig*. 5. a.

[‡] *fig*. 1. 2. 11. *fig*. 5. bb. *Brit. Miscell. ubi supra*, *fig*. 7. b.

[§] TAB. IX. *fig*. 1. 2. dd. *fig*. 3. ab.

[||] *fig*. 1. gg.

[¶] *fig*. 2. d. *fig*. 5. cc. *fig*. 6. b.

[**] *fig*. 2. u. q. *fig*. 3. e. *fig*. 5. dd. *fig*. 6. cc. *fig*. 7. a.

[††] *fig*. 5. ee. *fig*. 7. b.

Tibiæ apicem versus sensim crassiores, inermes: posticis duabus brevibus[*].

Tarsi omnes 4-articulati: articulo primo reliquis majori; sequentibus ferè obconicis, subtus membranâ vesiculari suffultis; extimo mutico[†].

Abdomen lineare, marginatum: segmentis 8—9.[‡]

STYLOPS[§].

Character Essentialis.

Antennæ bipartitæ: ramo superiori articulato.

Character Artificialis.

Antennæ bipartitæ: ramis compressis; superiori articulato.
Oculi pedunculati, subcellulosi.
Abdomen retractile carnosum.

Character Naturalis.

CORPUS oblongum.

Caput. *Mandibulæ* apice paulo crassiores[‖].

Palpi articulo primo magno, obconico, compresso; secundo semiovato acuto: subtus concavo[¶].

Labrum, vel processus *labri* loco, porrectum, acutum[**].

Nasus obtusus, ante antennas prominens et labrum obumbrans.

Antennæ stipite biarticulato: articulo primo sequente longiori, clavato vel obconico; apice obliquè truncato; secundo brevissimo, cylindrico, ramos duos emittente: inferiori paulo breviori, lanceolato et ferè auriformi, compresso, exarticulato supra concavo; superiori compresso, triarticulato: articulo primo longiori sublineari extrorsum paulo latiori; secundo brevi, tertio brevissimo apice rotundato, linearibus tenuioribus*.

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[*] Tab. IX. *fig.* 5. f f. *fig.* 7. c. [†] Tab. VIII. *fig.* 13. Tab. IX. *fig.* 8. 8. [‡] *fig.* 1. 2.

[§] *Monogr. Ap. Angl.* i. *tab.* 14. *n.* 11. *fig.* 1—9. ii. p. 110—114. *Sowerby Brit. Misc. n.* 9. *p.* 93—5. *tab.* 45. *Latr. Gen. Crust. Ins.* iv. *p. ult.*

[‖] *Monogr. Ap. Angl.* i. *t.* 14. *n.* 11. *fig.* 2. 5. b. and *Brit. Misc. ubi supra, fig.* 5. d d.

[¶] *Ibid. fig.* 2. 5. a. and *fig.* 5. c.

[**] I am unable to determine, from my imperfect specimens, whether this really be the *labrum* or not. There seems nothing answerable to it in *Xenos.*

Oculi hexagonis numerosis; septis minùs elevatis, unde subcellulosi evadunt.

TRUNCUS. *Scutellum* apice obtusum.

Interlumbium posticè valde convexum.

Postlumbium ferè verticale, corneum.

Proscutellum subtus cavum†.

Pedes trochanteribus posticis elongatis; tarsis articulo extimo fisso‡.

ABDOMEN carnosum intra processus trunci retractile: segmento extimo ventrali processu styliformi reflexo armato.

Larva nondum visa, in *Melittarum* corpore parasitica latet.

Pupa intra corpus Melittæ refocillata: corpore carnoso; capite corneo exserto; oculorum operculis cæcis§.

Metamorphosis coarctata?

XENOS‖.

Character Essentialis.

Antennæ bipartitæ: ramis exarticulatis.

Character Artificialis.

Antennæ bipartitæ: ramis semiteretibus exarticulatis symmetricis.

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[*] TAB. IX. *fig.* 12. a b. and *Brit. Misc. fig.* 5. *a b.*

[†] TAB. IX. *fig.* 6. d.

[‡] *fig.* 9. a.

[§] *fig.* 17. and *fig.* 18. a a.

[‖] *Rossi Fn. Etrusc. Mantiss. Append. Gen.* cxv. p. 114—116. *t.* 7. *fig.* B *b. Soc. Philomath. de Paris. Bull. Mai et Juin* 1794. *n.* 23. 24. *Descr. n.* 22. *Latr. Gen. Crust. et Ins. t.* iv. *p. ult.*

Oculi pedunculati cellulosi.
Abdomen exsertum corneum: ano carnoso.

Character Naturalis.

CORPUS lineari-oblongum.

CAPUT. *Mandibulæ* subflexuosæ, medio crassiores, acutæ[*].

Palpi articulo primo compresso flexuoso; secundo ovato acuto[†].

Labrum nullum aut obsoletum.

Nasus acutus, inter antennas frontem terminans[‡].

Antennæ stipite triarticulato[§]: articulis brevissimis; primo sequentibus paulo longiori ferè obconico; apice obliquè truncato; ultimo ramos duos semiteretes: superficie interiori plano; exteriori convexo; a basi ad apicem magnitudine sensim decrescentes, symmetricos emittente[||].

Oculi cellulosi: hexagonis paucioribus, vix ultra 50; septis crassioribus magis elevatis[¶].

TRUNCUS. *Scutellum* apice subemarginatum[**].

Postlumbium declive membranaceum.

Femoralia supra anticè concava.

Pedes coxis anticis brevissimis, reniformibus[††]; trochanteribus posticis coxis vix longioribus[‡‡]; femoribus posticis intus obtusangulis[§§]; tarsis articulo extimo integro[||||].

ABDOMEN corneum, proscutello longius, vix retractile: segmentis octo; podice minuto lineari adunco supra

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[*] TAB. VIII. *fig* 9. a.

[†] *Ibid.* b b.

[‡] TAB. IX. *fig.* 10. a.

[§] *Ibid.* b.

[||] *Ibid.* c.

[¶] *Ibid.* d d.

[**] *fig.* 1. e.

[††] *fig.* 3. d.

[‡‡] *fig.* 5. d d.

[§§] *Ibid.* e e.

[||||] *fig.* 8.

terminatum*, subtus stylo longiusculo lineari reflexo, basi dilatato; apice, ut videtur, fisso†? ano carnoso.

Larva in *Vespidarum* corpore parasitica, lanceolata, plicata, carnosa: capite variabili? compresso‡.

Pupa linearis carnosa intra abdomen *Vespæ* refocillata; capite exserto corneo; oculorum operculis fenestratis: fenestrulis hexagonis§.

Metamorphosis præcedentis.

Professor Peck considered the two insects from which I have formed these genera, merely as species of the same genus; but, not to mention the considerable diminution of the number of the hexagonal lenses in the eyes of *Xenos* and the much greater elevation and thickness of the septa which separate them, nor the cleft terminal joint of the tarsi in *Stylops*, or the abdomen fleshy in the latter and corneous in the former, besides other discrepancies of less importance, the very remarkable differences observable in the structure of their antennæ will, I think, fully warrant their separation. The singular fenestrated eye-covers, also, which form so very peculiar a character of the pupa of *Xenos*, and which are not to be found in that of *Stylops*, furnish another and very decisive argument for considering these insects as belonging to different genera.

Before I describe the insect I received from America, I shall give the diagnostic characters of Rossi's *X. Vesparum*, selected from those he has detailed in the work above alluded to, which will enable entomologists more easily to compare the two species together. I hope I shall stand excused for altering the trivial names by which both he and Professor Peck have distinguished their insects, since, as both are parasites of *Vespæ*, the trivial names *X. Vesparum* and *Vespæ* would lead to confusion; and, besides, a species should not be named from a *habitat* which is common to several or to a genus. I shall name one *Xenos Rossii*, and the other *Xenos Peckii*, in honour of the two discoverers.

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* Tab. IX. *fig.* 15. a. † *Ibid.* b. ‡ Tab. VIII. *fig.* 1. 3. 4. § *fig.* 7. a a. *fig.* 8. a.

XENOS ROSSII[*].

X. ater, antennis: ramis compressis, tarsis fuscis.

Habitat in *Vespa Gallica.*

DESCR. CORPUS atrum, fuliginosum.

CAPUT parvum. *Palpi* articulo primo brevi rotundo, altero elongato compresso. *Antennæ* breves vix capite longiores: ramis compressis et quasi ensiformibus.

TRUNCUS. Tarsi (quatuor?) fusci; subtus albidi.

XENOS PECKII.

X. nigro-fuscus, antennis: ramis semiteretibus dilutioribus albo punctatis, ano pallido, pedibus luridis: tarsis fuscis.

Long. Corp. 1½ lin.[†]

Hab. Larva et Pupa in *Poliste fuscata* Fabr. Americæ.

DESCR. CORPUS nigro-fuscum, ex pube brevissima et nisi sub lente forti omnino inconspicua opacum et quasi velutinum.

CAPUT inter antennas longitudinaliter elevatum et ferè carinatum. *Palpi* articulo primo secundo longiori[‡]. *Antennæ* capite longiores: ramis magis dilutè fuscis, subdiaphanis, punctis minutissimis albis, et, uti suspicor, hexagonis, nisi sub lente forti vix conspicuis irroratis[§].

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[*] *Rossi, ubi supra.*

[†] Professor Peck sent the measures taken by an accurate micrometer from recent specimens, as follows: Length of the body $\frac{15}{100}$ inch. Breadth of the head at the eyes $\frac{4}{100}$ inch. Length of one antenna $\frac{4\frac{1}{2}}{100}$ inch.

[‡] TAB. VIII. *fig.* 12.

[§] TAB. IX. *fig.* 10. b c.

TRUNCUS. *Thorax* posticè in medio obtusangulus. *Scutellum* longitudinaliter et late canaliculatum. *Postlumbium* pallidum. *Alæ* cinereo-albidæ: margine crassiori, nervisque nigris. *Pedes* cinerei vel potiùs luridi*:* tarsis nigricantibus.

ABDOMEN reliquo corpore magis obscurum: ano pallide rufescenti.

Rossi, in his description, which, extraordinary as he deemed his insect, appears to have been drawn up from a very cursory and inaccurate survey of it, mistakes the mandibulæ for setæ, and seems not to have traced them to their point of insertion under the head, since he merely says "*Labium breve, medio setigerum.*" He takes no notice either of the eyes being placed on a footstalk or pillar, or of the remarkable processes which defend the base of the abdomen on each side; nor do they appear in his figure: yet I cannot suppose that his insect wants these singular characters. The elytra he regards as an appendage of the thorax something similar to the *Halteres* of the *Diptera.*

Upon comparing the above descriptions of *X. Rossii* and *X. Peckii* together, we find that they not only differ in colour, but also in the length of the first joint of the palpi compared with the second, and in the shape of the branches of the antennæ. Rossi also makes no mention of the minute white dots which render those of *X. Peckii* so remarkable: therefore I feel little or no hesitation when I give them as distinct species.

The branches of the antennæ of Professor Peck's species, from their inner surface being plane, under certain circumstances are probably applied to each other, so as to form a single columnar branch gradually decreasing in diameter. What may be the use of these extraordinary organs? In the present instance, from their being semi-transparent and the white dots with which they are so thickly bestrewed, I feel something of a suspicion, that like those of *Pausus sphærocerus*[*] they may emit a phosphoric light, and serve to guide the insect in the dark labyrinths it may have occasion to explore. I give this, however, as mere conjecture.

Professor Peck, as we have seen, obtained his specimens of *X. Peckii* from *Polistes fuscata* Fabr.; but the *Vespa* in which I found the exuviæ mentioned in Mr. Sowerby's British Miscellany was quite a different species, and a true *Vespa* Fabr. The eye-covers in these exuviæ are similar to those in the Professor's insect; but whether they belonged to the same or another species, since other species may be attended by the same peculiarity, cannot be certainly known. As the *Vespa* in which I found them appears to be non-descript, I shall here add a description of it as connected with the subject of this paper.

VESPA CONCOLOR.

V. atra tota, mandibulis elongatis forficatis, abdomine: segmento secundo basi utrinque lineolâ elevatâ.

Long. Corp. lin. 7.

DESCR. CORPUS atrum, glabrum, obscurum.

CAPUT trunci fere latitudine punctatum. *Mandibulæ* elongatæ; apice forficatæ acutæ; intus tridentatæ: dentibus obtusis; supra longitudinaliter elevato-lineatæ. *Labrum* minutum, integrum. *Nasus* apice emarginatus.

TRUNCUS punctatus, anticè linea elevata dorsali lævi. *Alæ* nigræ, colore violæ paululùm tinctæ. *Tarsi* unguibus testaceis.

ABDOMEN ovato-lanceolatum, læviusculum, ex tomento parvo fuscescenti reliquo corpore magìs obscurum: segmento secundo (ut in plurimis vespis obtinet) magno sub-

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[*] Trans. Linn. Soc. iv. p. 261.

campaniformi; basi utrinque lineolâ elevatâ longitudinali. *Venter* segmento primo in medio declivi, exinde transversè striatulo, apice ipso lævi membranaceo fulvescenti; segmento secundo brevissimo valde depresso; tertio ascendenti convexo, adeo ut inter primum segmentum et tertium vallecula profunda interponitur. *Anus* incurvus.

The heads of the pupæ of this species of *Xenos*, as Rossi also states to be the case with his, emerge at the fourth dorsal segment of the abdomen.

EXPLANATION OF THE PLATES.

TAB. VIII.

Professor PECK'S *Figures.*

Fig. 1. Larva of *Xenos Peckii*, natural size.
2. Perfect Insect ditto.
3. Larva magnified seen on the back.
4. Head of ditto seen laterally, much magnified.
5. Abdomen of a wasp with part of one of the segments cut away to show the position of the pupa of ditto in its body. a. Pupa.
6. *Polistes fuscata* Fabr. with three of the pupæ of ditto in its abdomen at a a.
7. Operculum which separates from the other part of the shell of the pupa of ditto when the imago comes forth. a a. The eye-covers beset with hexagonal lenses.
8. *Xenos Peckii* magnified.
9. Head of ditto underside. a. Mandibulæ. b b. Palpi. c. Oral depression.
10. Ditto upper-side. a. Mandibulæ.
11. Front view of ditto. a. Mandibulæ. b b. Palpi.

12. One of the palpi seen laterally.
13. Tarsus of ditto, a. the vesicles inflated.
14. Two or three terminal joints of the abdomen seen obliquely, exhibiting the styloid process reflexed.

TAB. IX.

Additional Figures by FR. BAUER, *Esq.*[*]

Fig. 1. *Xenos Peckii* magnified. a. The head. b. The anterior piece of the trunk answering to the thorax in *Coleoptera* and to the collar in *Hymenoptera*; behind it is obtusangular. c. The second piece of the trunk called the *Dorsolum*, which answers to what has been principally taken for the thorax in *Hymenoptera.* In *Coleoptera* it is covered by the thorax. It corresponds with a. in fig. 31. dd. Elytra. e. Scutellum corresponding with b. in fig. 31. ff. Lumbi answering to d d. in ditto. g g. Wings. h. Interlumbium answering to e. in ditto. i. Postlumbium answering to f. in ditto. k. Proscutellum. This has no corresponding part in other insects. l l. Femoralia or lateral processes which defend the sides of the abdomen. m. Abdomen. n. Podex, or upper terminal segment. o. Styloid process or oviduct.

2. Lateral view of ditto. a. to o. refer to the same parts as in fig. 15, only in f. the concave sides of the lumbi are better seen. p. The posterior Coxa. q. Trochanter. r. A zigzag elevation of the anterior part of the lumbi, below which the wings are attached to the trunk. s. A piece between the coxæ of the anterior legs and the termination of the above line, which, perhaps, may assist in

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[*] *Figs.* 2. 5. 7. 18. TAB. IX. are magnified 15 times diameter or 225 times superficies; *figs.* 3. 8. 10. 11. 14. 15., 30 times diameter or 900 times superficies; *fig.* 16, 3 times diameter or 9 times superficies; *fig.* 17, 7 times diameter or 49 times superficies.

giving motion to the elytra. t. The reniform coxa to which the elytra appear to be attached. u. The trochanter of the anterior leg.

Fig. 3. An Elytrum with part of the anterior leg. a. The exterior or convex side of the elytrum. b. The interior or concave side. c. The piece between the zigzag line (*fig.* 16. r.) and the anterior coxa. d. Coxa. e. Part of the Trochanter.

4. Part of the side of the trunk. a. Part of the wing. b e. Parapleura. b. The end of ditto on which the wing seems to sit. c. Scapulare. d. Pleura. f. Part of the Mesostethium. g. Part of the Femorale.

5. Posterior part of the underside of the trunk. a. Part of the Mesostethium. b b. Femoralia or lateral processes. c c. The posterior Coxæ. d d. Posterior Trochanters. e e. Femora. f f. Tibiæ. g. Tarsus. h. Vesicles.

6. Part of the underside of the Trunk of *Stylops Melittæ*. a a. Femoralia. b. Coxæ. c c. Trochanters. d. Proscutellum hollow below.

7. An intermediate leg of *Xenos Peckii*. a. Trochanter. b. Femur. c. Tibia. d. Tarsus.

8. 8. Front and lateral view of one of the tarsi. a. Part of tibia. b. Tarsus. c. Vesicles.

9. Part of the leg of *Stylops Melittæ*. a. Bifid apex of tarsus.

10. Head of *Xenos Peckii*. a. Nasus. b. The triarticulate stipes of the antennæ. c. The two branches dotted with hexagons ? which proceed from it. d d. Eyes. e e. Elevated spaces behind ditto.

11. Part of the antenna of *Stylops Melittæ* to show its flat branches.

Fig. 12. Ditto viewed laterally. a. The first joint of the stipes. b. The second. c c. Part of the two branches.

13. Antenna of *Gyrinus natator*, which is likewise bipartite. a. The stipes embedded in the head. b. A shorter exterior auriform branch ciliated with hairs, intended probably to shelter the inner branch. c. The inner branch or genuine antennæ.

14. 15. The four last segments of the abdomen of *Xenos Peckii.* a. Podex. b. The reflexed style.

16. The trunk of *Buprestis vittata* after the thoracic shield is taken away. It is inserted in this plate to explain the corresponding parts in the trunk of *Xenos*. a. Dorsolum. b. Scutellum. c. Postscutellum. d d. Lumbi. e. Interlumbium. f. Postlumbium. g. Nates. h. Posterior cavity of the trunk.

17. Pupa of *Stylops Melittæ* after it had been some time extracted.

18. Head and Neck of ditto. a a. Eye-covers.

N.B. This plate is defective in giving no figures of the under side of the anterior part of the trunk; but this could not be done with accuracy without partly destroying the specimens.

VII. *A Mo-*